PRIVATE AND CONFIDENTIAL

RESEARCH DEPARTMENT

THE RONETTE CRYSTAL MICROPHONE CARTRIDGE TYPE MC.65

Report No. L-029

(1956/3)

THE BRITISH BROADCASTING CORPORATION

ENGINEERING DIVISION

RESEARCH DEPARTMENT

THE RONETTE CRYSTAL MICROPHONE CARTRIDGE TYPE MC.65

Report No. L-029

(1956/3)

W. I. Manson, B.Sc. (Eng.)
D.E.L Shorter, B.Sc. (Eng.), A.M.I.E.E.

T Somerville
(T. Somerville)

Report No. L-029

THE RONETTE CRYSTAL MICROPHONE CARTRIDGE TYPE MC. 65

Section	Title	Page
	SUMMARY	1
1	DESCRIPTION OF MICROPHONE	1
2	METHOD OF MEASUREMENT	2
3	FREQUENCY RESPONSE	2
4	SENSITIVITY	2
5	IMPEDANCE	2
6	NOISE	4
7	CONCLUSIONS	4

February 1956

PRIVATE AND CONFIDENTIAL

Report No. L-029

(1956/3)

THE RONETTE CRYSTAL MICROPHONE CARTRIDGE TYPE MC.65

SUMMARY

The report gives test results on three samples of the Ronette diaphragm-type crystal microphone cartridge MC.65. The performance varies considerably between individual specimens but is on the average superior to that of earlier microphones of this kind.

1. DESCRIPTION OF MICROPHONE.

The Ronette MC.65 microphone is a pressure-operated diaphragm-type instrument incorporating a Rochelle salt crystal element; it is described by the manufacturers as a "cartridge" but can be used as a self-contained microphone in any application where there is no danger from mechanical damage, rain or dirt. The microphone is manufactured in Holland by Ronette and imported by Trianon Electric Ltd. The price to the Corporation in April 1955 was 15s. 6d.

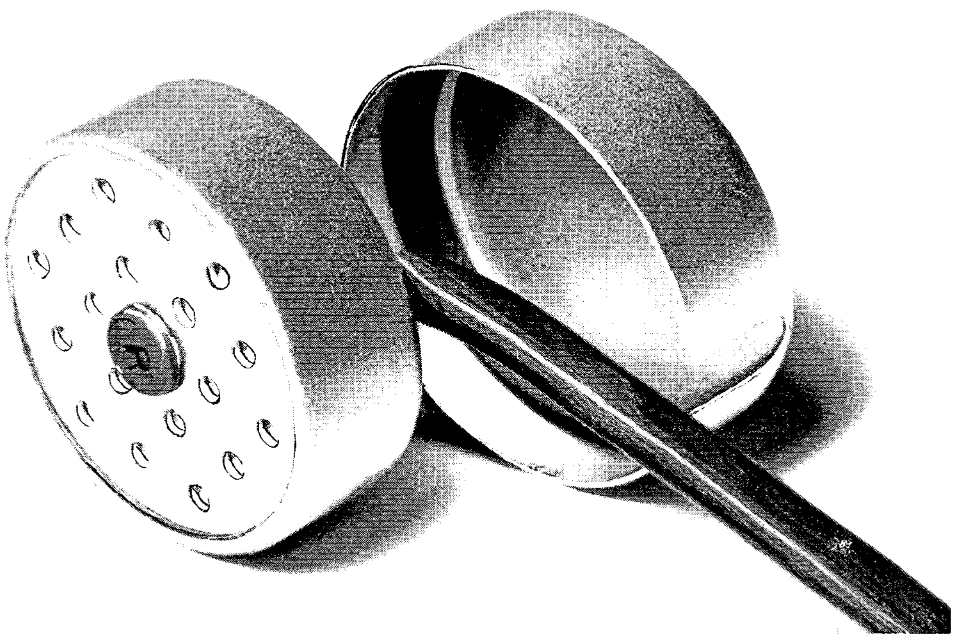

Fig. 1

Fig. 1 shows the external appearance of the MC.65 microphone. A conventional twister type Rochelle salt element is actuated by a metal diaphragm in the form of a slightly flared cone. In front of the diaphragm is mounted a unit consisting of a pair of perforated plates, with their openings in alignment and a layer of cloth sandwiched between them, the whole affording mechanical protection together with a measure of acoustic damping. The output connections take the form of soldering tags which are covered by a removable screening cap, shown separately in the figure.

Dimensions and Weight.

	With Rear Cap	Without Rear Cap
Diameter	3·0 cm	2·9 cm
Depth	1·5 cm	1·1 cm
Weight	12 gm	8 gm

2. METHOD OF MEASUREMENT.

The microphone characteristics were measured in the dead room by the method of substitution using a calibrated pressure microphone. The accuracy of comparison with the standard is within $\pm \frac{1}{2}$ dB and the calibration of the standard itself is known to the same degree of accuracy.

3. FREQUENCY RESPONSE.

Figs. 2, 3 and 4 give the open-circuit axial frequency response curves of three specimens; for specimen A the response to sound incident at 90° is also shown. It will be seen that the characteristics of specimen A exhibit many irregularities and that specimens B and C are even worse in this respect. An earlier specimen, for which only approximate data is available, showed somewhat smoother characteristics than specimen A.

The average rise in response at high frequencies approximates to the form produced by an RC pre-emphasis circuit and rough equalisation can thus be readily effected. The equivalent time-constant for the specimens so far tested is about 40 μs, corresponding to the chain-dotted characteristic shown in Fig. 2; it should be noted however that the manufacturers recommend a de-emphasis time-constant of 66 μs for equalisation. For 90° incidence the general trend of the response is roughly flat within its working range.

4. SENSITIVITY.

The mid-band open-circuit sensitivities of specimens A, B and C are respectively -56 dB, -57 dB and -58 dB with reference to 1 volt/dyne/cm^2.

5. IMPEDANCE.

The impedance of the microphone approximates to that of a capacitance of some 1200 $\mu\mu$F combined with series and parallel resistances of the order of 1500 ohms to 5000 ohms and 40 megohms respectively. The grid leak of the associated pre-amplifier could therefore be made as low as 3 megohms without causing appreciable loss in the voice-frequency range.

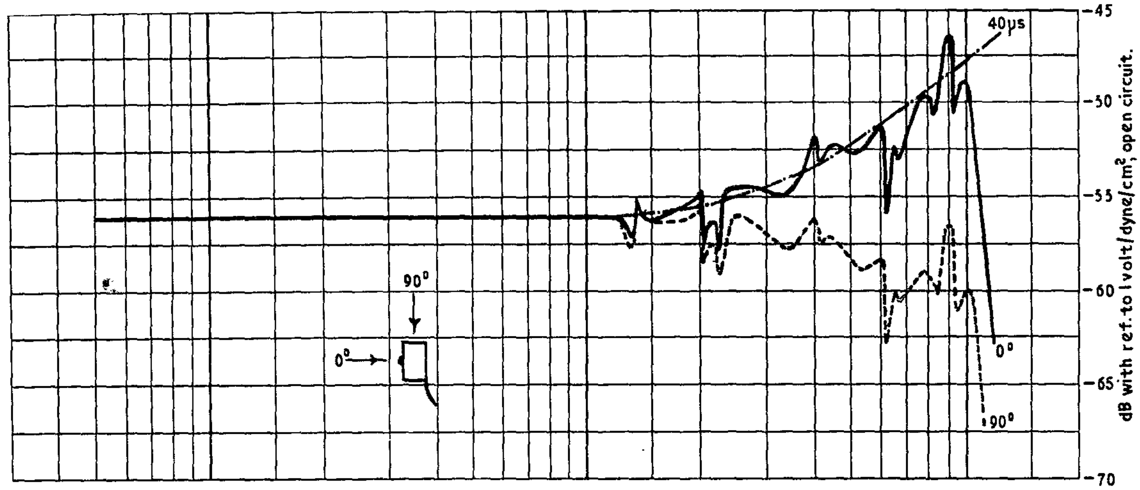

Fig. 2 - Frequency response curves specimen A

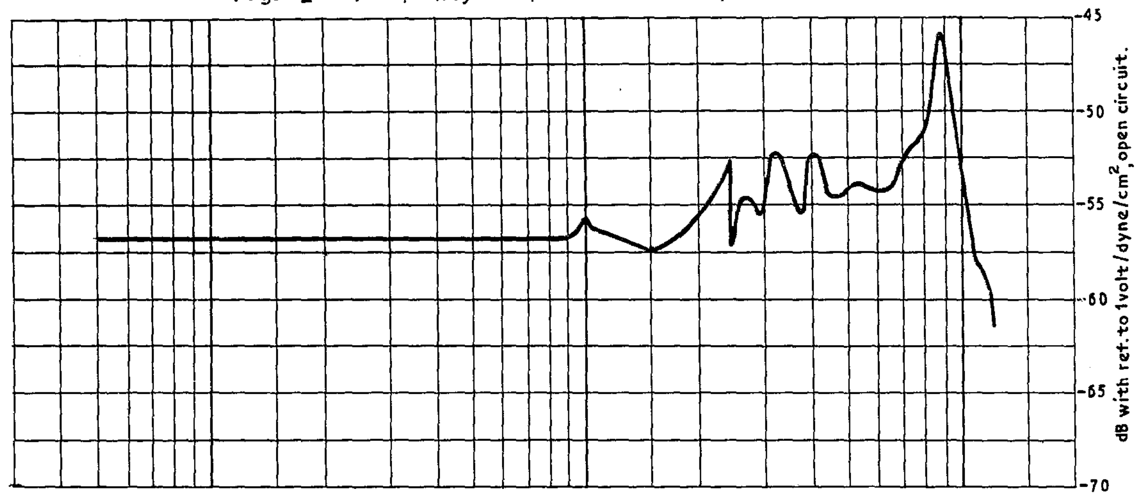

Fig. 3 - Axial frequency response curves specimen B

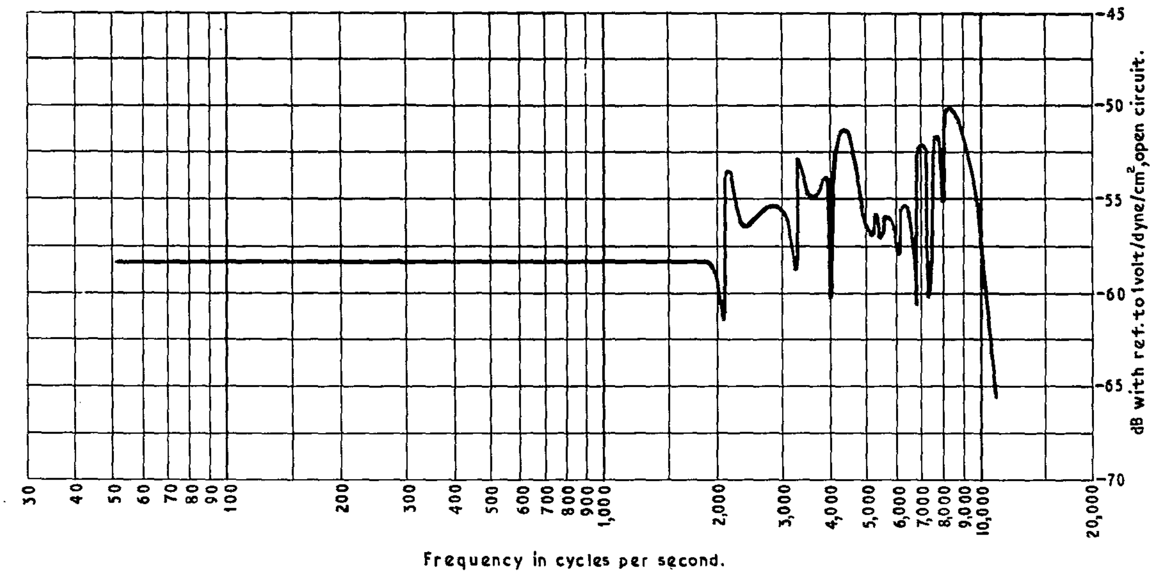

Fig. 4 - Axial frequency response curves specimen C

6. NOISE.

The self-generated noise of the microphone arises from thermal agitation in the series resistance component of its impedance. The corresponding noise in the shunt component is largely by-passed by the capacitance component and is negligible by comparison; the same applies to the noise from the grid leak of the associated amplifier provided that the value of this resistance is not less than about 3 megohms. The weighted* noise due to the series resistance lies in the range −120 dB to −115 dB with reference to 1 volt. Taking the sensitivity of the microphone as −57 dB with reference to 1 volt/dyne/cm^2, the sound level at 1000 c/s required to generate a voltage equal to that of the weighted noise is between +11 dB and +16 dB with reference to 0·0002 dyne/cm^2. In practice, these figures will be increased by the addition of valve noise. Selected quiet valves, such as are used in electrostatic microphones, will give the same order of noise as does the microphone itself, but in general, the microphone noise will be swamped and the overall signal/noise ratio determined entirely by the valve.

7. CONCLUSIONS.

The frequency characteristics for the first specimen of the MC.65 appeared promising but those of later models are very ragged above 2000 c/s. From previous experience with microphones of this type it is known that such irregularities in response commonly result from slight deformation of the diaphragm or surround. This defect could probably be avoided by extra care in manufacture, but the unit is already being produced in large numbers at a low price, and it therefore seems unlikely that the makers would consider it worth their while to take the necessary trouble. In spite of these shortcomings the MC.65 microphone is superior to the other diaphragm-type crystal microphones at present available in this country; it has already found application in the "wireless microphone" portable transmitter used in the television service and is also suitable for use with the E.M.I. midget recorder.

* Using an aural sensitivity network type ASN/3.

EGF

Printed by B.B.C. Research Department, Kingswood Warren, Tadworth, Surrey